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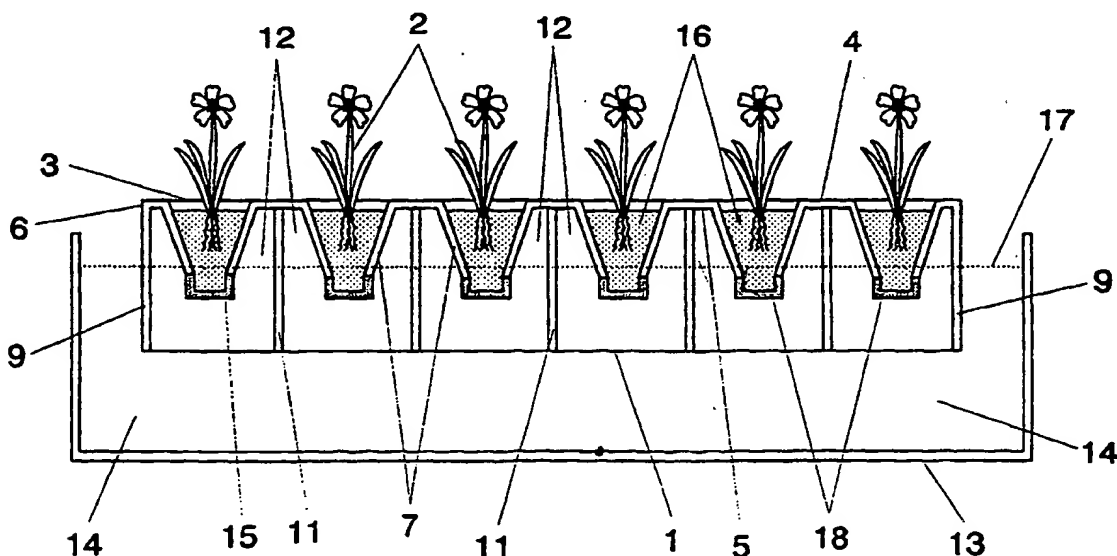
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(57) Abstract

Floating tray (1) for cultivation of seeds, bulbs, cuttings, plants (2) or the like. The tray (1) includes a top (3) having an upper (4) and a lower (5) horizontal surface, an outer rim (6) and a plurality of openings or downwards directed and at least upwards open tubular or conical integrated or in the openings inserted cells (7) and is produced through moulding of at least one polymeric material. The rim (6) constitutes a downwards directed substantially closed and circumambient outer wall (9) and the top (3) is divided into two or more sections (10) by means of one or more partition walls (11) arranged on its lower surface (5). The tray (1) floats on two or more air cushions (12) underneath the surface (5), which air cushions (12) are formed by air trapped therebeneath (5) and between the outer wall (9) and the partition wall or walls (11) when the tray (1) horizontally is positioned on a liquid, such as water in basin (13), pool or similar.

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## FLOATING CULTIVATION TRAY

The present invention relates to a tray primarily intended for pre-cultivation or cultivation of for instance seeds, bulbs, cuttings, plants or the like. The tray is moulded in a polymeric material and includes a top, an outer rim/wall and a plurality of cells or openings wherein said plants etc. are cultivated. The tray floats on two or more air cushions formed by air trapped underneath the top and between the rim and under the top arranged partition walls dividing the lower surface of the top into at least two sections.

Various trays for pre-cultivation and/or cultivation of seeds, bulbs, cuttings, plants and similar have for some time been used within horticultural and agricultural areas. Cultivation trays normally include a plurality of integrated cells or inserts, corresponding to and working as for instance pots or the like, whereby holding said seeds, plants etc. and for instance a growth medium such as earth or turf. These cultivation trays are made from a number of quite different materials such as coated cardboard, laminated paper, turf, ceramics, metals or plastics and are, depending on the material, either intended for single or multiple use.

Recently a new pre-cultivation/cultivation method has come into use, wherein so called floating trays are utilised. Floating trays have the same kind of cells or inserts as above conventional ones and floats in a basin, pool or the like containing water and preferably one or more nutrients. The major advantage of floating trays compared to conventional is that water and possible nutrients are kept at substantially invariable levels. The tray material is, however, limited to materials being substantially non-absorbant having a density allowing the tray and its content to float on water. This means that various polyme-

ric materials of a material density well below 1, for instance porous materials such as foamed polystyrene and foamed polyurethanes, normally are used. The base of a floating tray must, to allow contact between water/nutrients and plant cells or inserts and thus the breeding material therein, be open. An open base with no base wall upon which the tray can float makes the choice of low density materials even more important.

The floating trays used today exhibit a number of disadvantages and drawbacks. The material is often a single use material or a material difficult to reuse without uncertainty regarding function and/or material quality. Normally used materials can not be for instance injection moulded using conventional methods. Furthermore, the root systems of plants cultivated therein tend to grow into the a low density and/or porous material, thus negatively effecting both plants and material.

Among planters there are a certain demand for floating trays being easily reusable, easy to clean and not effecting plants in the aforementioned way. This demand would be possible to satisfy by the use of polymeric materials such as polyolefines, preferably polyethylene, polypropylene or polybutylene, vinyl or vinylidene polymers or co-polymers, preferably polyvinyl chloride, polyalkylene terephthalates, polycarbonates, polyamides, pheno and amino plastics and non-foamed polystyrene or polyurethane. The material density of said polymers is, however, usually close to or exceeding 1, meaning that a tray made therefrom will sink when it is positioned on a water surface unless air, working as or being an air cushion, is trapped underneath the top of the tray. A tray floating on such an air cushion is very instable and an involuntary tilting will, due to the fact that all or so large an amount of trapped air escapes that its floating ability disappears, sink the tray.

The present invention makes it possible to produce a floating tray, primarily intended for pre-cultivation or cultivation of seeds, bulbs, cuttings, plants or the like, made through moulding of at least one polymeric material, which material per se is non-floating. The tray includes a top having an upper and a lower horizontal surface, an outer rim and a plurality of openings or downwards directed and at least upwards open tubular or conical cells, which cells are integrated parts of the tray or are inserted in said openings. The cells are intended to hold said seeds, bulbs, cuttings, plants, etc. and optionally a growth medium, such as earth, turf or the like, or alternatively inserts such as pots or the like. The rim of the tray according to the invention constitutes a downwards directed and substantially closed and circumambient outer wall and the top is divided into two or more sections by means of one or more partition walls arranged on its lower surface, whereby the tray floats on two or more air cushions underneath said surface. The air cushions are formed by air trapped between the outer wall and the partition wall or walls when the tray horizontally is positioned on a liquid surface in basin, pool or similar containing a fluid, such as water and/or at least one nutrient.

Moulding methods suitable to be utilised in the production of a floating tray according to the present invention include processing techniques such as injection moulding, gas injection moulding, blow moulding and extrusion.

Suitable polymeric materials, from which the tray according to the invention is made, include polyolefines, such as polyethylene and polypropylene, vinyl or vinylidene polymers and copolymers, such as polyvinyl chloride, polyalkylene terephthalates and polycarbonates. The density of the polymeric material is normally close to or exceeding 1 and will not per se make the tray float on for instance water without the aid of said

trapped air in form of air cushions. The tray will, by dividing the lower surface of the tray top into two or more separated sections and thus separating the amount of trapped air into two or more air cushions, float, without exhibiting instability, on water. An involuntary tilting of the tray will only result in a minor amount, at most equal to one or maybe, depending on the number of sections, a few sections, of trapped air escaping from underneath the tray. The major amount of the trapped air in form of air cushions will still be left and the cultivation tray will thus still float.

The root system of plants and the like will not, as with porous and low density materials such as foamed polystyrene, grow into the according to the invention preferred polymeric materials. A tray according to the invention is easy to clean and a highly stable floating pre-cultivation or cultivation trays intended for multiple use.

The number of cells or openings in the tray top is among other things dependent on the type of seeds, bulbs, cuttings, plants etc. A suitable number is 30 to 120, such as 50 to 70 when, for instance tobacco, cabbage and/or tomatoes are pre-cultivated to a certain stage of growth.

According to one embodiment of the present invention, each cell or insert individually has a closed base. The base is perforated by at least one hole or is produced in a permeable or semi-permeable material and can, furthermore, be an inserted or an integrated part of said cell or insert.

According to alternative embodiments each cell or insert individually has an open base, which base optionally can be closed by a lid or the like. Each cell or opening may, independently of the cell or insert base, individually be of a different or of an equal size and/or shape.



In yet further embodiments of the floating tray according to the present invention, the outer wall/rim and each partition wall individually is of a different or an equal height. Each partition wall may, furthermore, individually be detachable, whereby the number and location of the partition walls can be adjusted to specified needs or demands.

The tray top and hence the cells or inserts and their content, can in order to regulate for instance light, humidity, temperature etc., wholly or partly be covered by a transparent or non-transparent lid, cover or the like.

These and other objects and the attendant advantages will be more fully understood from the following detailed description, taken in conjunction with appended Figures 1-7, wherein like reference numerals have been applied to like parts throughout the various Figures and wherein:

- Figure 1 is a flat side view of a partial crosscut of a floating tray according to an embodiment of the invention, which embodiment has integrated cells.
- Figures 2 - 3 are flat side views of crosscuts of floating trays according to two embodiments of the invention, one with integrated (Figure 2) and one with inserted (Figure 3) cells.
- Figure 4 is a flat side view of a floating tray according to the same embodiment as Figure 2. The tray is positioned in a water containing basin and plants are growing in its cells. The tray as well as the basin is shown in as crosscuts.
- Figures 5 - 7 are flat base views of three floating trays according to three embodiments of the invention. The trays each include a lower top surface being divided into 4, 12 and 15 sections, respectively, by partition walls.

Figure 1 shows a flat side view of a partial crosscut of a floating tray 1 according to an embodiment of the invention.

The tray 1 includes a top 3 having an upper 4 and a lower 5 horizontal surface, a circumambient rim 6 extending downwards into an outer wall 9 of the tray 1. The top 3 includes a plurality of integrated cells 7 having open bases 15. The cells are intended to hold a growth medium, such as earth 16 (see Figure 4) or an insert in form of a pot or the like. The lower surface 5 of the top 3 is divided into sections 10 by means of partition walls 11 having a height equal to the outer wall 9.

Figure 2 shows a flat side view of a crosscut of a floating tray 1 according to a second embodiment of the invention. The tray 1 includes parts corresponding to and having a function similar to parts shown in Figure 1, with one exception: Each cell 7 is provided with a closed base 15 made of a permeable material 18.

Figure 3 shows a flat side view of a crosscut of a floating tray 1 according to a third embodiment of the invention. The tray 1 includes parts corresponding to and having a function similar to parts shown in Figure 1, with one exception: The top 3 includes openings wherein cells 7 having a base 15 provided with a hole 8 are inserted. The cells 7 can optionally be replaced by for instance pots or the like.

Figure 4 shows in the same view the same embodiment of a floating tray 1 as Figure 2 with equal number and type of integrated cells 7 being parts of its top 3 and partition walls 11. The top 3 has as in Figure 2 an upper 4 and a lower 5 surface and the tray 1 is surrounded by a rim 6 extending downwards into an outer wall 9. The tray 1 is positioned in a basin 13 containing water 14 and nutrients. The basin 13 is like the tray 1 shown as a flat side view of a crosscut. The tray 1 floats on water 14 aided by air cushions 12 formed when the tray 1 were hori-

zontally positioned on a water surface 17. The air cushions 12 consist of air trapped in pockets limited by the lower surface 5, the water surface 17, the outer wall 9, the cells 7 and the partition walls 11. Each cell 7 has been filled with earth 16 and plants 2 are growing therein. The water 14 penetrates each cell base 15, which base 15 is made of a permeable material 18, thus maintaining an invariable humidity and nutrient level.

Figures 5, 6 and 7 show flat base views of three floating trays 1 (see Figures 1-4) according to three embodiments of the invention. The trays 1 are seen in views showing a lower surface 5 of respective tray 1 top 3 (see Figures 1-4). The top 3 includes a plurality of cells 7 having open bases 15 (see Figures 1-4). Figure 5 show a tray 1 having a lower surface 5 being divided into four sections 10 defined by means of three parallelly arranged partition walls 11 and by an outer wall 9, and Figure 6 show a tray 1 having a lower surface 5 being divided into twelve sections 10 defined by means of five intersecting partition walls 11 and by an outer wall 9. Figure 7 show a tray 1 having a lower surface 5 being divided into fifteen sections 10 defined by means of a plurality of partition walls 11 connecting a plurality of cells 7 and by an outer wall 9.

While particular embodiments of the invention have been shown, it will be understood, of course, that the invention is not limited thereto since many modifications may be made, and it is, therefore, contemplated to cover by the appended claims any such modifications as fall within the true spirit and scope of the invention.

**CLAIMS**

1. Floating tray (1) primarily intended for pre-cultivation or cultivation of seeds, bulbs, cuttings, plants (2) or the like, which tray (1) includes a top (3) having an upper (4) and a lower (5) horizontal surface, an outer rim (6) and a plurality of openings or downwards directed and at least upwards open tubular or conical integrated or in said openings inserted cells (7), which cells (7) are intended to hold said seeds, bulbs, cuttings, plants (2) etc. and optionally at least one growth medium, such as earth (16), turf or the like, or inserts such as pots or the like  
c h a r a c t e r i s e d i n, that the tray (1) is produced through moulding, such as injection moulding and blow moulding, of at least one polymeric material, that the rim (6) constitutes a downwards directed substantially closed and circumambient outer wall (9) and that the top (3) is divided into two or more sections (10) by means of one or more partition walls (11) arranged on its (3) lower surface (5), whereby the tray (1) floats on two or more air cushions (12) underneath the surface (5), which air cushions (12) are formed by air trapped therebeneath (5) and between the outer wall (9) and the partition wall or walls (11) when the tray (1) horizontally is positioned on a liquid surface (17) in basin (13), pool or similar containing a fluid (14), such as water and/or at least one nutrient.
2. Floating tray according to claim 1  
c h a r a c t e r i s e d i n, that the polymeric material is a polyolefine, such as polyethylene and polypropylene, a vinyl or vinylidene polymer or co-polymer, such as polyvinyl chloride, a polyalkylene terephthalate, a polycarbonate or a polyamide.

3. Floating tray according to claim 1 or 2

characterised in, that each cell (7) or insert individually has a closed base (15) being perforated by at least one hole (8) or being produced in a permeable or semi-permeable material (18), which base (15) is an inserted or an integrated part of the cell (7) or the insert.

4. Floating tray according to claim 1 or 2

characterised in, that each cell (7) or insert individually has an open base (15), which base (15) optionally can be closed by a lid or the like.

5. Floating tray according to any of the claims 1 - 4

characterised in, that each cell (7) or opening individually is of a different size and/or shape.

6. Floating tray according to any of the claims 1 - 4

characterised in, that all cells (7) or openings are of an equal size and shape.

7. Floating tray according to any of the claims 1 - 6

characterised in, that the outer wall (9) and each partition wall (11) individually are of a different height.

8. Floating tray according to any of the claims 1 - 7

characterised in, that the outer wall (9) and each partition wall (11) are of an equal height.

9. Floating tray according to any of the claims 1 - 8 characterised in, that at least one partition wall (11) is detachable, whereby the partition walls (11) can be adjusted in number of location.

10. Floating tray according to any of the claims 1 - 9 characterised in, that the top (3) wholly or partly is covered by a transparent or non-transparent lid, cover or the like.

11. Floating tray according to any of the claims 1 - 10 characterised in, that each cell (12) of the

**Fig. 1**

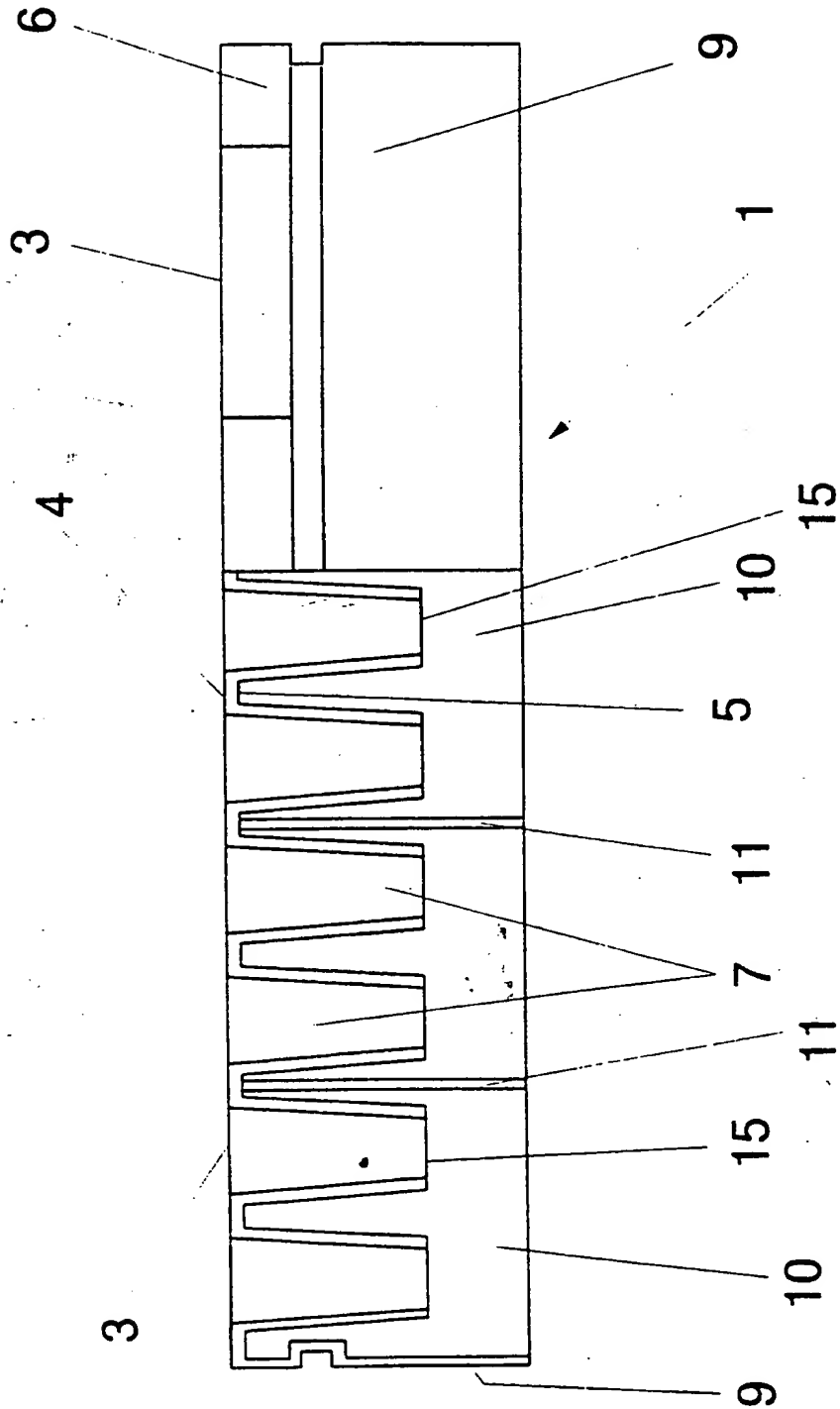
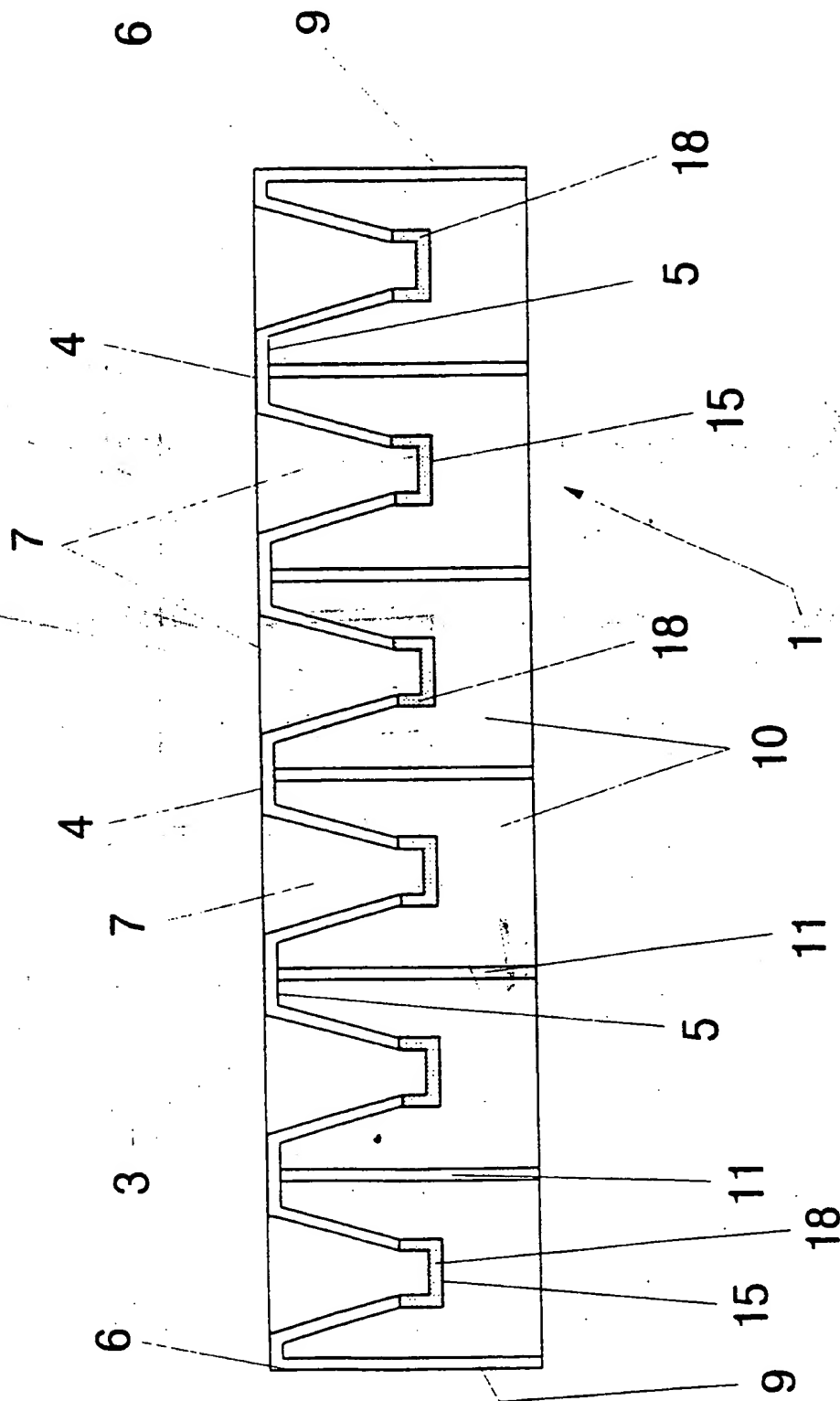
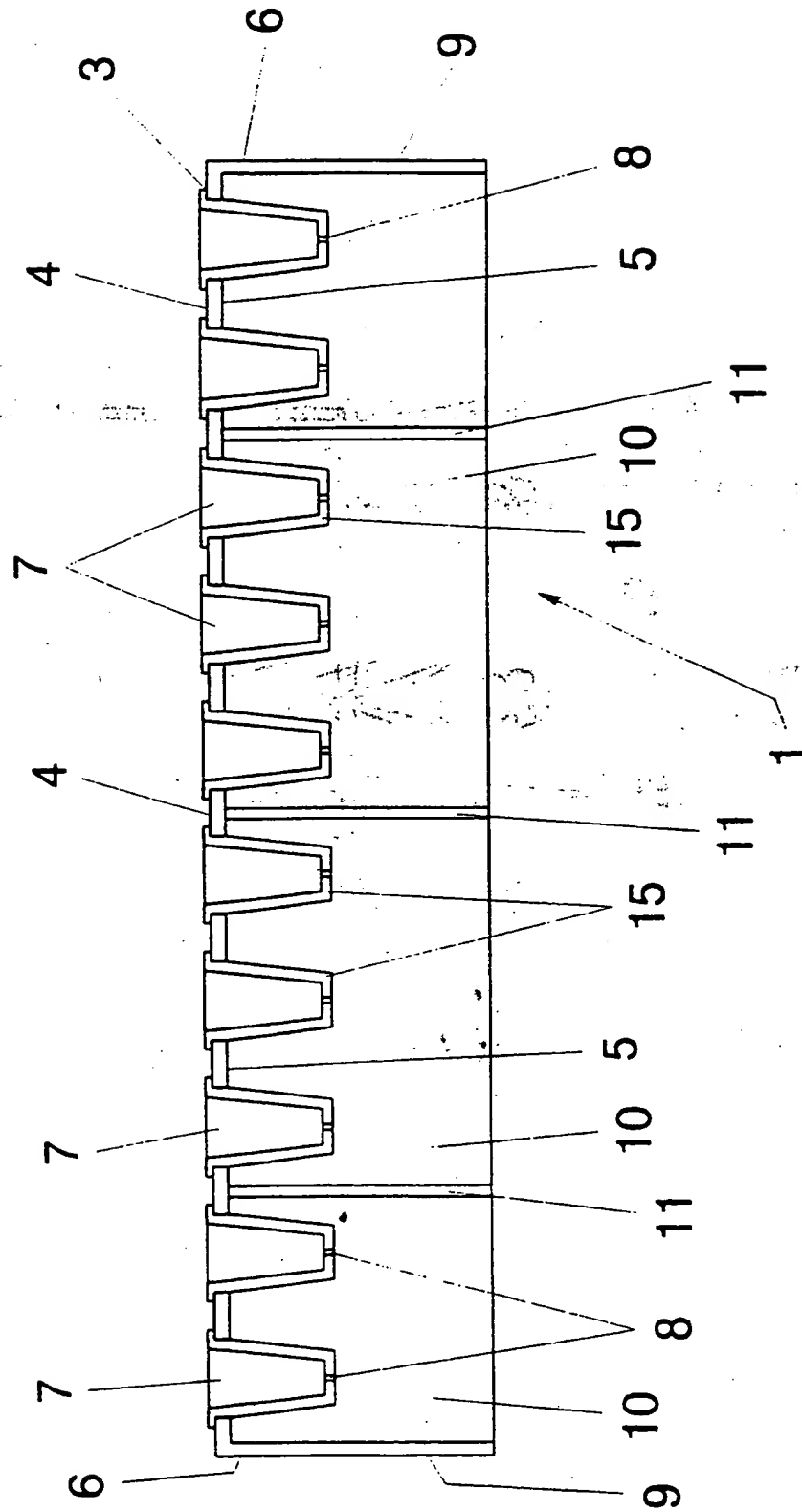


Fig. 2

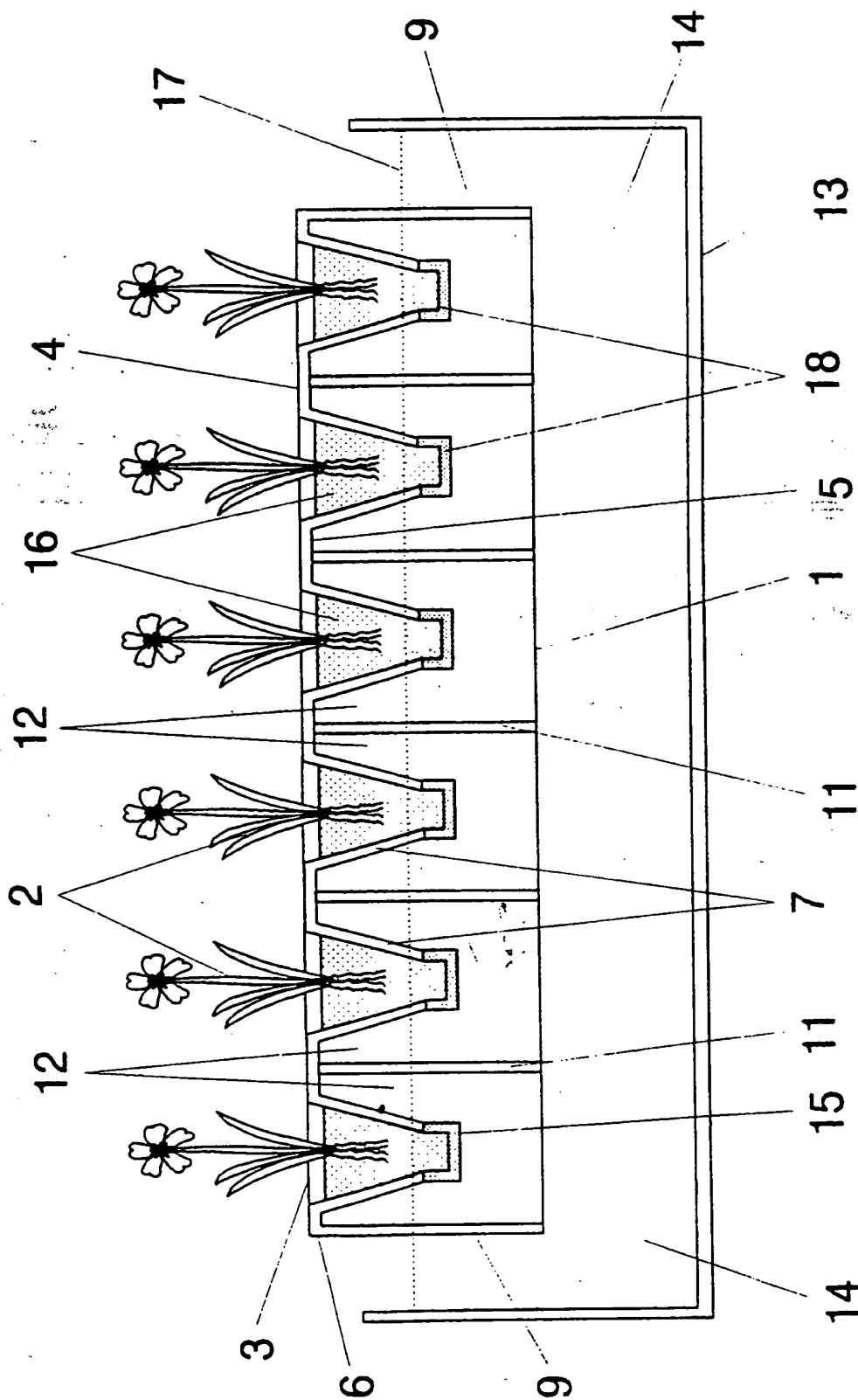


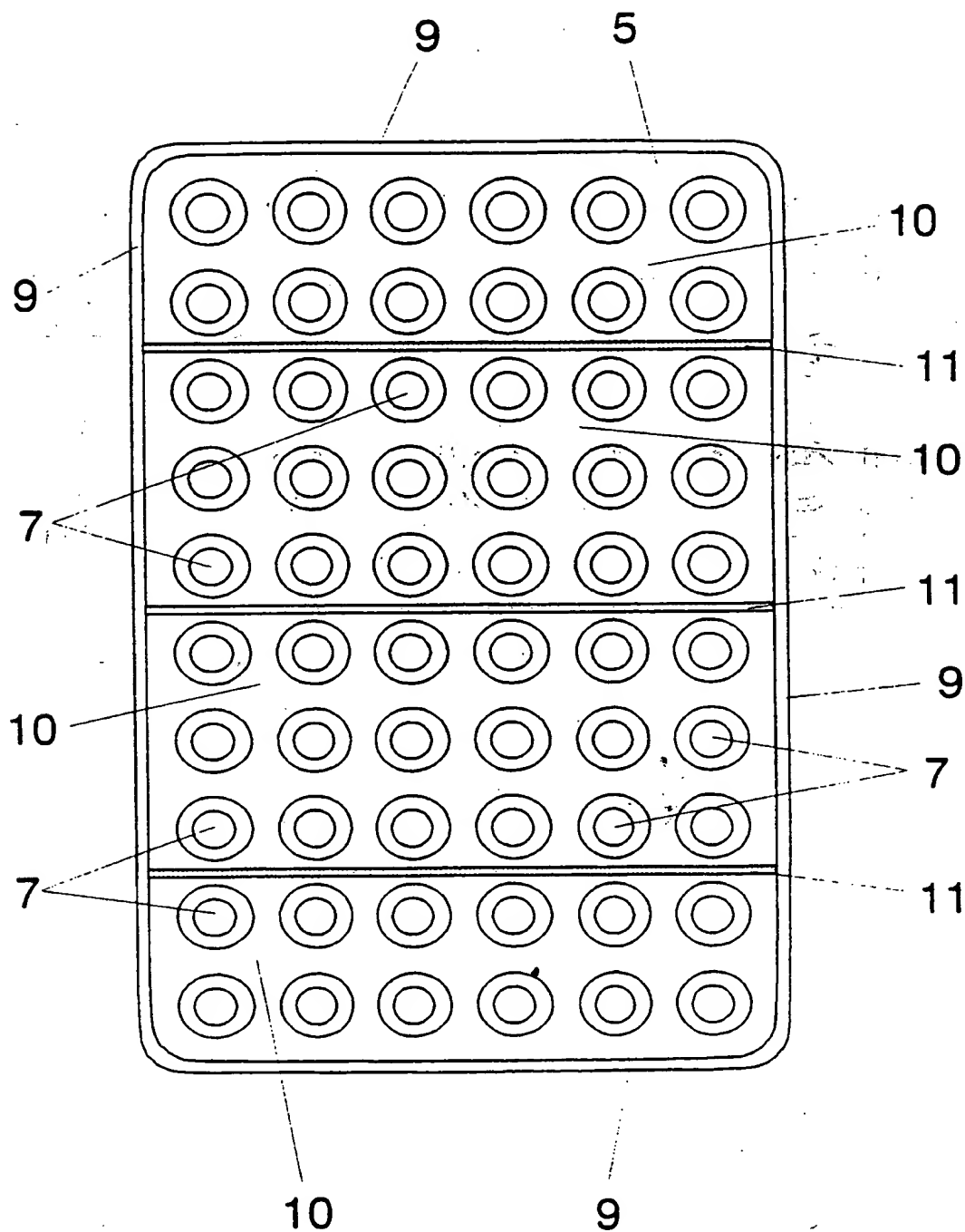


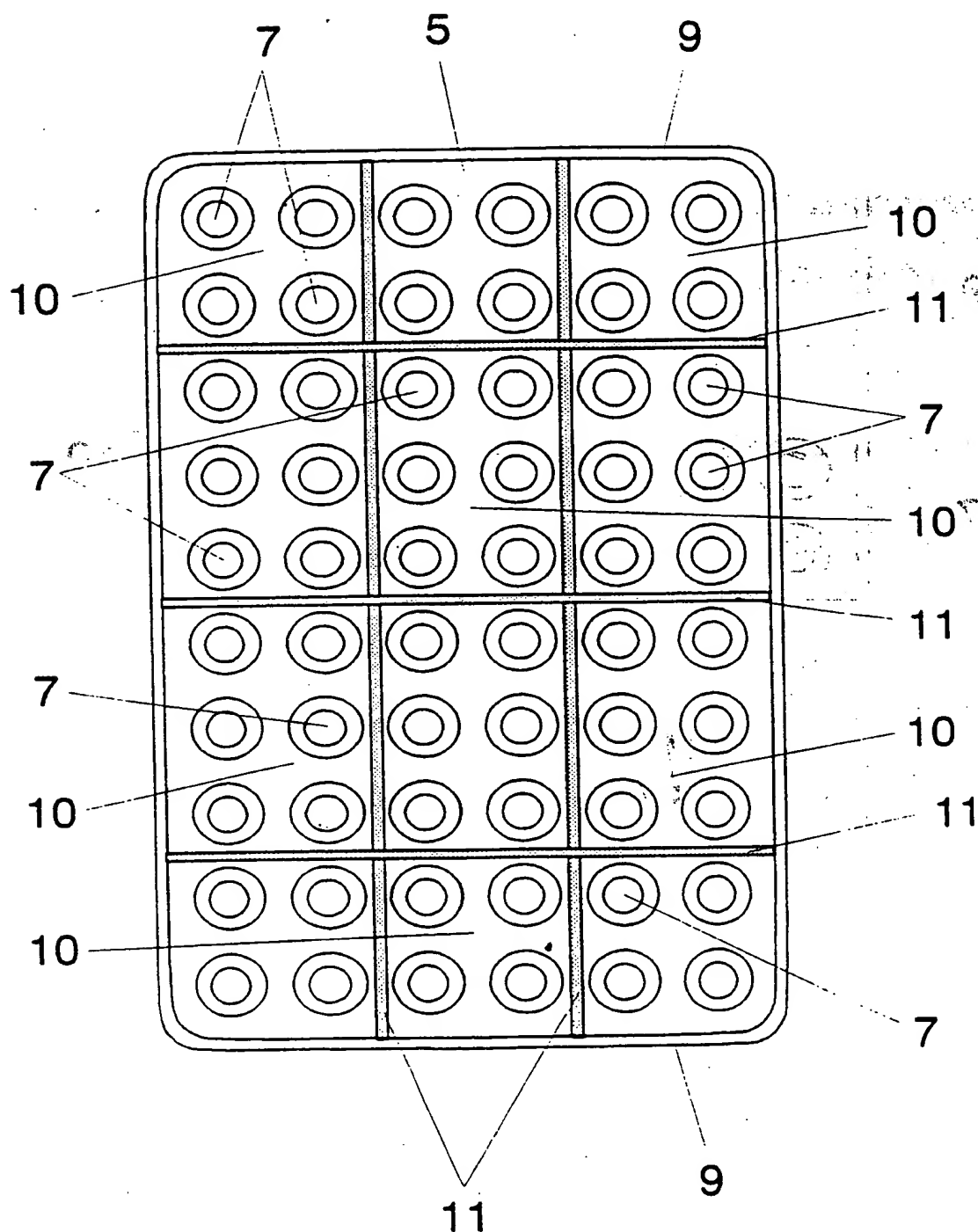
**Fig. 3**



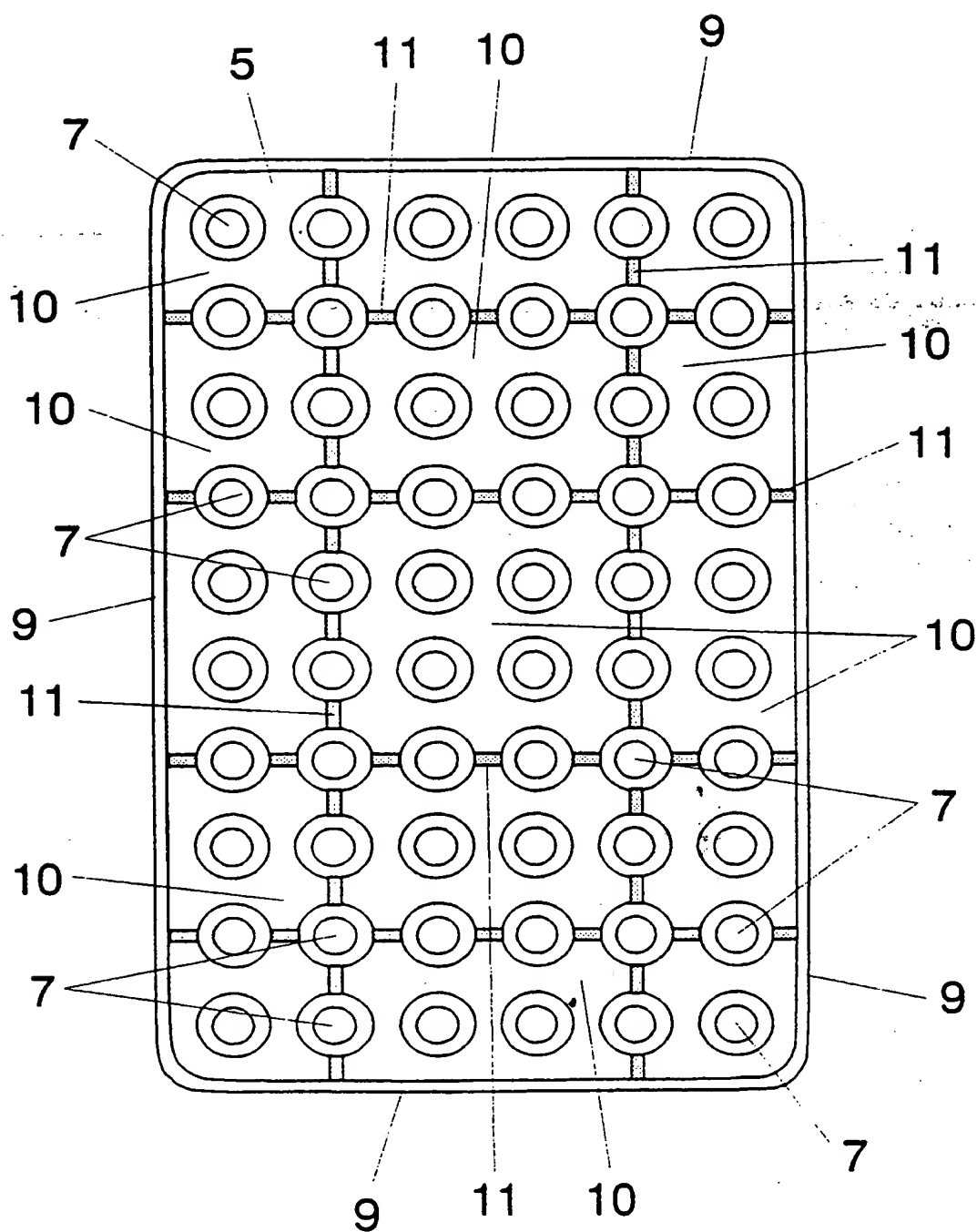
**Fig. 4**



**Fig. 5**

**Fig. 6**

# Fig. 7



## INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 96/00496

## A. CLASSIFICATION OF SUBJECT MATTER

IPC6: A01G 31/02 // A01G 9/14

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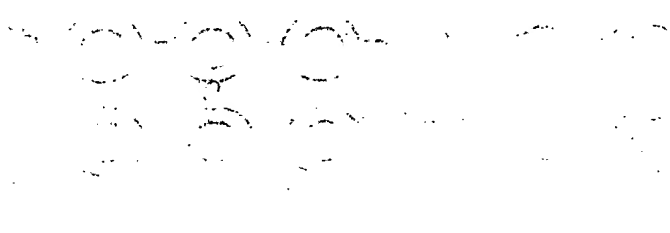
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Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5261185 A (K. KOIDE ET AL), 16 November 1993 (16.11.93), figure 37  -----  	1-10

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

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Information on patent family members

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US-A- 5261185	16/11/93	NONE	

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